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RAINFALLS OF 10 INCHES, OR MORE, DURING 24 HOURS, IN THE UNITED STATES

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The purpose of this paper is to make available a compilation of 293 official records of excessive rainfalls that the writer has assembled. It is believed that the data here collected will be of value for many purposes; but in using them, it must be kept in mind that they do not constitute a complete record of all excessive rains that have occurred in the United States. The particular records included were gathered from several sources: The sectional *Summaries of Climatological Data* give for some states the maximum 24-hour rainfalls. The monthly issues of *Climatological Data* by States yield numerous records, but for most States only the maximum fall for the month is given. Various articles in the MONTHLY WEATHER REVIEW include further records; and the monthly report on "River Stages and Floods" often mentions exceptionally heavy rainfalls, including sometimes the maxima in 24 hours. Although these data are only partly from the records of Weather Bureau Stations, these publications have led to correspondence with section directors who have often supplied official station records. A number of station directors have kindly supplied lists of official rainfalls of 10 inches or more in 24 hours for their areas. Finally, J. B. Kincer, chief of the Climate and Crop Weather division of the Weather Bureau, supplied the revised records (including 1940) of maximum rainfalls at each of the present stations, and at some discontinued stations, for 39 States; these records include only the maximum and hence, since some stations have had more than one rainfall in excess of 10 inches, do not include all such occurrences.

The 293 official records here given do not, therefore, include even all the rains of this magnitude which have been recorded in the United States by the Weather Bureau since its establishment. Furthermore, exceptionally heavy rains are usually limited to a small area, and probably the majority of them do not affect any Weather Bureau gages. Various evidence, including the numerous unofficial records mentioned from time to time in the MONTHLY WEATHER REVIEW, indicates that rainfalls in excess of 10 inches in 24 hours occur in some areas considerably more widely or frequently than the official records suggest. For example a rainstorm near

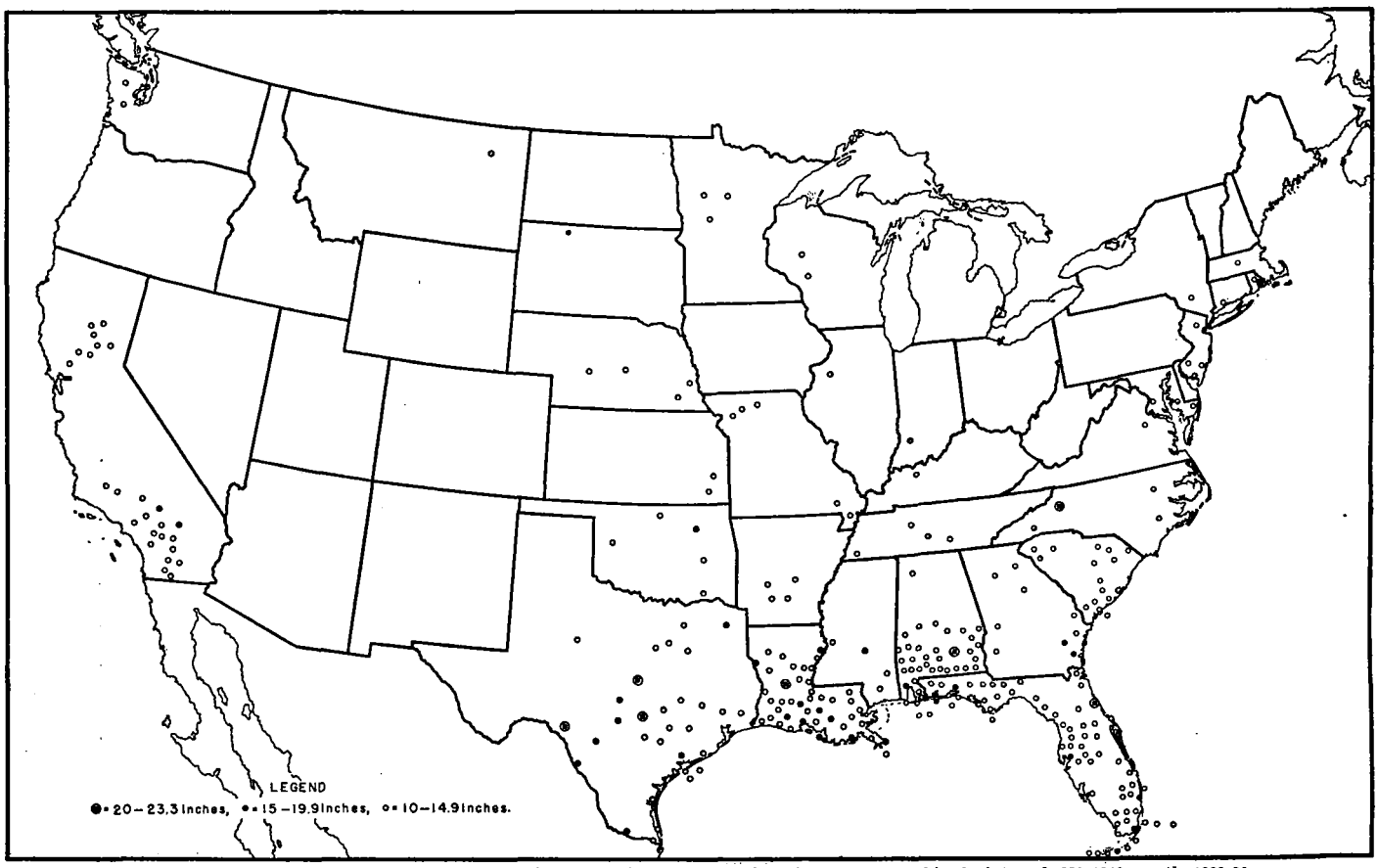

FIGURE 1.—Distribution of 293 torrential 24-hour rains at Weather Bureau stations, from records within the interval 1880-1940, mostly 1929-39.

Tulsa, Okla., on September 3–4, 1940, yielded only 1 official record in excess of 10 inches, but afforded 34 unofficial records of that magnitude (scattered over seven counties) that were acceptable to the Weather Bureau and were published in the MONTHLY WEATHER REVIEW for September 1940. Probably many excessive rains are never observed or recorded at all; and of course new records of heavy rainfalls are being established every year.

With a few exceptions, it is reasonable to assume that areas having few recorded storms have relatively few unrecorded storms. The chief exceptions to this generalization are the localities which possess few Weather Bureau stations. For example, the southern Appalachian Mountains presumably experience many more rainfalls in excess of 10 inches in 24 hours than the official records indicate. The occurrence of "flash floods" in streams leading from these slopes, and of landslides and other evidences of severe erosion imply occasional very heavy rains. Another area which presumably has more exceptionally heavy rains than the recorded number would indicate, is the State of Mississippi, which has far fewer records than the adjacent States.

The following table and accompanying map give by States the records of rainfalls in excess of 10 inches in 24 hours that were available to the writer.[1] Seven of these records are in excess of 20 inches in 24 hours, namely 23.3 inches at New Smyrna, Fla., 23.1 inches at Taylor, Tex.; 22.2 inches at Altapass, N. C.; 21.4 inches at Alexandria, La.; 20.4 inches at Smithville, Tex.; 20.1 inches at Montell, Tex.; and 20.0 inches at Elba, Ala.

Some of these official records represent duplication in that they were established at the same time that other records were established. For example, the storm of March 14–15, 1929, brought 10-inch rains to 8 Alabama Weather Bureau Stations, and the tropical cyclone of August 12–19, 1939, brought such rains to parts of Florida, Alabama, South Carolina, and New Jersey.

[1]Previous discussions of various types of excessive rains will be found in the following papers:

Kincer, J. B.: Maximum precipitation in 24 hours and in 1 hour, figs. 70, 75 of Precipitation and Humidity, sec. A, pt. 11; Atlas of American Agriculture, U. S. Department of Agriculture, 1922.

Henry, A. J.: Distribution of excessive rainfalls in the United States, MO. WEA. REV., 56: 355–363, 1928.

Ibid: Excessive rains in Southeastern Alabama, 57: 319–322, 1929.

Mindling, G. W.: Heavy Rainfall in Georgia (with some data on other States). idem. 61: 295–299, 1933. Two records which he mentions have not been located. He reports that Oregon has one official record of 12.18 inches in 24 hours and Tennessee one of 14.98 inches. Neither date not place are mentioned.

Theaman, J. R.: Heavy Rainfall Records (pamphlet), Indianapolis, 1931.

Yarnell, D. L.: Rainfall Intensity-Frequency Data, Miscel. Publ. No. 204, U. S Department of Agriculture, 1935.

OFFICIAL RECORDS, BY STATES, OF RAINFALLS OVER 10 INCHES IN 24 HOURS (TO DEC. 31, 1940)

	Inches	Date
ALABAMA		
Alaga	12.7	7/7–8/16.
Bay Minette	10.5	9/28/17.
Do	12.0	9/20/26.
Brantley	10.7	3/15–16/38.
Brewton	13.0	3/14–15/29.
Do	12.6	9/20/26.
Clanton	11.2	7/6–7/16.
Coffee Springs	14.1	3/14–15/29.
Do	11.1	4/22–23/28.
Daphne	12.0	8/15/01.
Do	10.0	9/27/06.
Elba	20.0	3/14–15/29.
Eufaula	10.9	7/7–8/16.
Eutaw	12.6	4/16/00.
Evergreen	11.9	7/6/16.
Geneva	11.0	3/15/29.
Livingston	10.0	4/17/00.
Marion (near)	11.5	8/14–15/39.
Millry	10.3	11/20/34.
Mobile	11.6	3/14–15/29.
Do	13.0	6/26/00.
Mobile Airport	10.6	10/17–18/37.
Montgomery	10.0	1/12–13/92.
Newton	10.3	3/22/97.
Do	11.8	3/14–15/29.
Do	10.9	8/31 & 9/1/37.
Ozark	13.4	3/14–15/29.
Do	10.4	9/1/37.
River Falls	11.2	3/15/29.
Robertsdale	12.5	7/5/16.
Do	17.5	9/28/17.
Do	11.7	9/20–21/26.
Seven Hills	13.3	7/16/31.
Silverhill	12.7	9/20–21/26.
Spring Hill	12.0	9/21/26.
Thomasville	12.4	6/4–5/28.
Troy No. 1	10.2	9/20/26.
Tuscumbia	10.0	7/10/92.
ARKANSAS		
Arkadelphia	12.0	6/28/05.
Jessieville	11.0	4/20/27.
Little Rock	10.0	4/8–9/13 (?)
Story	11.4	4/21/24.

OFFICIAL RECORDS, BY STATES, OF RAINFALLS OVER 10 INCHES IN 24 HOURS (TO DEC. 31, 1940)—Continued

	Inches	Date
CALIFORNIA		
Bear Valley Dam	12.9	1/17/16.
Big Bear Dam	15.1	3/2/38.
Campo	11.5	8/12/91.
Cuyamaca	12.4	2/22–23/91.
Do	12.8	2/16/27.
Glen Ranch	12.4	1/10/10.
Helen Mine	10.4	2/24/17.
Do	10.4	12/31/13.
Inskip	10.4	12/31/13.
Julian	10.4	2/16/27.
La Porte	12.0	5/18/11.
Lytle Creek	13.0	1/17/16.
Magalia	10.9	1/18/06.
Mono Rach	11.5	3/12/06.
Mount St. Helena	14.7	4/20–21/80.
Mount Wilson	12.8	3/1–2/21.
Do	11.8	3/2/28.
Nellie	11.2	1/17/16.
Opids Camp	14.9	3/2/38.
Do	10.0	12/31/33.
Rialto	12.9	1/17/16.
San Gabriel Dam	13.4	3/2/38.
Stirling City	10.1	12/31/13.
Squirrel Inn	16.8	1/17/16.
West Branch	10.0	1/31/13.
CONNECTICUT		
Bridgeport	11.0	7/29/05.
FLORIDA		
Allapattah	10.1	10/19/24.
Apalachicola	10.1	9/—/06.
Do	11.7	9/13–14/32.
Bartow	11.5	9/5/33.
Belle Glade	10.9	11/7/32.
Blountstown-Bristol	10.0	9/20/26.
Bonifax	16.1	7/7/16.
Caryville	10.0	8/14/39.
Chapman Field Garden.	10.1	9/29/29.
Clermont	12.5	9/25–26/94.
Do	10.9	9/5/33.
Cottage Hill	13.1	10/5/34.
Davenport	11.8	9/5/33.
Do	14.1	6/15/34.
Davie	10.2	9/29/37.
Daytona Beach	12.9	10/10/24.
De Funiak Springs	10.8	7/8/16.
Everglades	12.5	6/14/36.
Federal Point	11.3	9/26/94.
Fellsmere	10.5	9/21–22/29.
Fernadine	13.1	10/20–21/82.
Fort Meyers	11.7	6/13/01.
Fort Pierce	10.0	10/13/36.
Garniers	10.1	10/5/34.
Hilliard	12.5	8/28–29/11.
Homestead	11.5	10/5/33.
Do	10.0	9/3/35.
Hypoluxo	16.8	10/15–16/10.
Do	10.4	9/24/94.
Indiantown	12.0	7/31/33.
Inverness	10.5	9/5/33.
Jupiter	13.2	9/17–18/04.
Key West	11.2	10/—/09.
Do	12.0	9/—/19.
Do	15.1	11/ /25.
Do	13.5	10/4/33.
La Belle	12.5	6/15/31.
Lake Alfred-Lucern Park.	10.2	9/5/33.
Long Key	11.8	11/4/35.
Mammoth Grove (Lake Wales).	10.0	8/8/28.
Mayport	12.2	7/29/82.
McDonald-Zellwood.	10.9	9/—/94.
Merrits Island	11.1	10/3–4/99.
Miami	14.1	11/30/25.
Do	10.6	9/28–29/29.
Do	10.3	9/6–7/31.
Do	10.2	8/29–30/32.
Monticello	10.5	8/15/28.
Mount Pleasant	10.4	9/16/24.
New Smyrna	23.2	10/10–11/24.
Panama City	10.0	8/8/06.
Do	10.5	8/6/32.
Pensacola	10.7	6/—/87.
Do	17.1	10/4–5/34.
Do	10.6	4/24/37.
Perry-Fenholloway	10.5	6/14/34.
Pinellas Park	10.3	8/2/15.
Quincy	12.9	9/15/94.
Rockwell	12.0	7/2/09.
Sebastian	12.2	10/2–3/99.
St. Leo	13.1	6/15/34.
St. Petersburg	15.5	8/2/15.
Stephenville	14.0	7/11/98.
Sumner	13.3	6/1/01.
Tarpon Springs	11.1	6/30/09.
Vernon	12.2	8/31/37.
FLORIDA—con.		
Wausau	15.0	11/23/07.
West Palm Beach	12.0	7/31/33.
GEORGIA		
Blakely	10.9	3/14–15/29.
Cornelia	10.5	9/30/36.
Glennville	15.0	9/27/29.
Greensboro	10.4	8/13/40.
Griffin	10.4	8/8/83.
Meldrim	10.5	9/5–6/33.
St. George	18.0	8/28/11.
Savannah	10.0	9/15–16/24.
Do	11.4	9/17–18/28.
ILLINOIS		
La Harpe	10.2	6/10/05.
INDIANA		
Princeton	10.5	8/6/05.
IOWA		
Bonaparte	12.1	6/10/05.
Chariton (near)	11.2	8/27/03.
Hopeville	10.3	8/26–27/03.
Keosauqua	11.2	6/10–11/05.
Larabee	13.0	6/24/91.
Muscatine	10.7	8/10/15.
Primghar	13.0	7/14–15/00.
Sioux Center	11.7	9/17–18/26.
KANSAS		
Moran	10.3	9/7/15.
Neosha Falls	13.0	9/12/26.
KENTUCKY		
Greenville	10.1	6/21/35.
LOUISIANA		
Abbeville	17.5	8/9/40.
Alexandria	21.4	6/15–16/86.
Angola	11.1	5/20/35.
Bella Chasse	15.4	10/2/37.
Cameron	14.2	9/18/08.
Cheneyville	13.1	6/16/86.
Do	11.0	3/27/14.
Covington	10.4	6/5/28.
Crowley	19.7	8/9/40.
Delta Farms	10.5	4/15/27.
Donaldsonville	14.5	8/26/26.
Franklin	12.3	9/6–7/93.
Franklinton	10.2	9/30/15.
Grand Cane	11.6	11/23/40.
Grand Coteau	16.0	8/9/40.
Do	10.3	5/6/35.
Hempstead	16.0	11/24/40.
Jennings	13.9	8/15/38.
Lafayette	19.6	8/9/40.
Lake Arthur	14.7	11/12–13/32.
Lake Charles	10.0	4/27/24.
Logansport	18.0	7/24/33.
Do	11.3	11/23/40.
Melville	12.3	5/6/35.
Merryville	10.1	4/27/14.
Monroe	12.1	12/29–30/84.
Morgan City	15.6	4/15/27.
New Orleans	14.0	4/15/27.
Do	13.0	9/6–7/29.
Do	13.1	10/1–2/37.
Okaloosa	12–6	3/9/78.
Pharr	18.5	4/15/27.
Port Eads	11.3	10/1/98.
Plain Dealing	12.0	7/6/20.
Point Pleasant	16.5	6/12/78.
Do	13.5	12/19/82.
Do	12.3	9/5/85.
St. Francisville	13.5	9/21/09.
Shreveport	12.4	7/24/33.
Simmesport	14.1	5/20/35.
Venice	10.1	12/26/04.
Ville Platte	10.5	8/15/38.
Woodworth	11.2	7/25/33.
Winnfield	11.1	1/4–5/39.
MARYLAND		
Cambridge	10.3	9/5–6/35.
Cheltenham	11.7	8/12/28.
Jewell	14.7	7/26–27/97.
MASSACHUSETTS		
Barre	11.8	9/20–21/38.

OFFICIAL RECORDS, BY STATES, OF RAINFALLS OVER 10 INCHES IN 24 HOURS (TO DEC. 31, 1940)—Continued

	Inches	Date
MINNESOTA		
Bagley	10.0	7/20/09.
Beaulieu	10.8	7/20/09.
Mahnomen	10.8	7/20/09.
MISSISSIPPI		
Bay St. Louis	10.1	5/17/32.
Edwards	16.7	7/7–8/92.
Merrill	12.2	7/5–6/17.
	12.3	7/—/16.
MISSOURI		
Bethany	10.1	7/—/—.
Fisk	10.3	7/4/37.
Grant City	12.2	7/—/—.
Marysville	10.8	7/—/—.
New Madrid	10.0	9/2–3/36.
MONTANA		
Circle (near)	11.5	6/20/21.
NEBRASKA		
Beatrice	11.1	7/23/11.
Greeley Center	12.0	6/5/96.
Loup City	10.1	6/5/96.
Plattsmouth	10.7	7/6/98.
NEW JERSEY		
Clayton	10.5	9/1/40.
Paterson	11.4	10/8–9/03.
Pleasantville	10.2	8/19–20/39.
Tuckerton	14.8	8/19–20/39.
NEW YORK		
Salisbury Mills	10.5	10/9/03.
NORTH CAROLINA		
Altapass	22.2	7/14–15/16.
Blantyre	13.2	7/16/16.
Elsworth	13.0	9/15–16/81.
Falkland	13.5	8/4–5/94.
OKLAHOMA		
Enid	10.8	8/16–17/32.
Cheyenne	13.8	4/3–4/34.
Hugo	10.0	5/11/20.
Meeker	12.2	6/3/32.
Sapulpa	15.5	9/3–4/40.
RHODE ISLAND		
Westerly	12.2	7/—/32.
SOUTH CAROLINA		
Anderson	11.6	8/25/08.
Beaufort (near)	10.8	8/31/98.
Do	10.8	8/11/40.
Charleston	10.6	9/5–6/33.
SOUTH CAROLINA—continued		
Clemson College	10.0	9/30/36.
Connors	12.4	8/27–28/93.
Darlington	10.1	7/15/16.
Effingham	13.2	7/15/16.
Florence	11.1	7/14–15/16.
Kingstree	12.6	7/15/16.
Laurens	10.7	9/26/29.
Liberty	11.1	8/25/08.
Manning	13.2	8/27–28/93.
Port Royal	10.8	8/31/98.
St. George	10.2	8/26–27/93.
Summerville	10.2	8/11–12/40.
TENNESSEE		
Cedar Hill	10.0	6/17–18/34.
McMinnville	11.0	3/28/02.
Memphis	10.5	11/20–21/34.
Rock Island	10.3	3/22–23/29.
TEXAS		
Austin	19.0	9/9–10/21.
Brachsville	11.0	10/1/81.
Brownsville	10.0	9/5–6/33.
Cuero	12.4	6/29–30/40.
Eagle Pass	15.6	6/29/36.
Freeport	12.0	7/22/33.
Fort Clark	18.0	6/14/89.
Galveston	14.3	7/13–14/00.
Do	14.1	10/7–8/01.
Do	10.5	1/24/40/
Hallettsville	11.3	7/1/36.
Hillsboro	11.3	9/27/36.
Hills Ranch	16.0	9/10/21.
Kaufman	14.2	8/22–23/08.
Do	14.2	9/27/36.
La Grange	10.0	6/29–30/40.
Matagorda	15.7	5/1/11.
Mercedes	15.0	9/5/33.
Mexia	11.8	9/4/32.
Montell	20.1	6/28/13.
Richmond	11.6	7/12/39.
Rockland	10.1	5/27–28/29.
San Angelo	11.8	9/15/36.
San Benito	12.7	9/5/33.
Sinton	12.4	4/28/30.
Smithville	20.4	6/29–30/40.
Taylor	23.1	9/9–10/21.
Terral	18.0	2/22–23/79.
Uvalde	13.5	7/2/32.
Yoakum	10.7	4/25/38.
VIRGINIA		
Guinea	11.2	8/24/06.
WASHINGTON		
Quinault	12.0	1/21/35.
Spruce	11.6	1/21/35.
WISCONSIN		
Butternut	10.2	7/24–25/97.
Merrill	11.3	7/23–24/12.

The symbols on the map are located as exactly as possible, but in certain crowded areas they depart slightly from the true positions; for example, Alabama has 38 such records, all but one in the southern half of the State, and 13 are in the small southwestern area which lies west of Florida, near Mobile. Ten other records were established in the extreme southeastern corner of the State. Other crowded areas are in southern and eastern Florida, and in southeastern Texas.

From this map, it is evident that the southern part of the South has had many rains in excess of 10 inches in 24 hours, and that there is a rapid decline in frequency within a hundred miles or so of the coast, not only along the Gulf but along the Atlantic and the Pacific. In the interior, there is in general a progressive northward decline in the number of these rains; the chief exceptions are local increases in the Southern Appalachians and near the Balcones Escarpment of the Texas Plateau.

AN ANALYSIS OF THE STORMS

The following analysis is of the *storms* which brought rainfalls in excess of 10 inches in 24 hours, not of the *individual records;* in most cases, the grouping is in accordance with the Weather Bureau report, although in a few cases two records were counted as one storm merely because near together in time and place, and may sometimes have been separate thunderstorms. Of the 204 storms here classified, 163 occurred in the South, 25 in the North, and 16 in the West. Of the 39 storms which yielded more than 15 inches, the South had 37 and California 2. As to season and month of occurrence (of those for which these data are available) the summer had 82 rains of more than 10 inches, autumn 77, spring 29, winter 16. September had 48, July 33, June 22, August 27, October 18, March 13, November 11, April 8, and May 8; the winter months each about 4. Of the 16 winter rains, the South had 7, California 8, Washington 1. Of the 29 spring rains, the South had 23, California 5, and Missouri 1. Of the 82 summer rains, the South had 48, the North 19. Of the 77 autumn rains, the South had 68, the North 8, the West 1. Thus of the 10-inch rains in the North, about four-fifths occurred in summer; but in the South, only about one-third.

The 37 rains of over 15 inches in 24 hours in the South occurred in 9 of the 12 months; June, September, and October had 6 each, August 5, November 5, July 4, April 2; and February, March, and May, each 1.

REGIONAL CONTRASTS IN THE FREQUENCY OF TORRENTIAL RAINS

The map also shows that the various parts of the United States differ sharply in the number of official records of rains in excess of 10 inches in 24 hours. All of the records of more than 20 inches in 24 hours, and most of those of 15 to 19.9 inches are in the southeastern quarter of the country. Moreover, that region also has a predominant share of the records of 10 to 15 inches.

Because of the variation in the length of the different rainfall records, and in the number of recording stations, and analysis of all of the records entered on the map would be less illuminating than an analysis of more closely comparable data. Hence the following analysis has been made of all the records in the issues of *Climatological Data* for 1939–37 and 1939.

The "Deep South," that is the 5 States bordering the Gulf of Mexico plus Georgia and South Carolina, had a total of 8 official records of rainfalls of 15 inches or more in 24 hours in that 10-year period. The "Upper South," that is the 8 States from Oklahoma to Maryland, had no official record of rainfall of this intensity in that decade, nor did the North (the North-Central and Northeastern States), or the West (the Rocky Mountain and Pacific States).

The Deep South had 67 official records of rainfalls of 10 to 14.9 inches in 24 hours in the decade, or an average of more than 6 per year. The Upper South had 8; and the North, 4, of which 2 were in Missouri and 2 in New Jersey. The West (Washington) had one.

Of all official records of rains of over 10 inches in 24 hours, the Deep South had in that decade about 10 times as many as the Upper South and 15 times as many as all the North and West.

In proportion to area, the Deep South had in that 10-year period about 12 times as many official records of rains of over 10 inches in 24 hours as did the Upper South,

and more than 100 times as many as did the North (21 States). None were recorded from the Rocky Mountain States and only one from the Pacific States during these 10 years.[2]

Several factors contribute to the greater frequency of torrential rains in the Southern States. The most important probably is the fact that tropical cyclones are relatively much more frequent there. A large proportion of the rains here studied occurred in tropical cyclones, although only a few in storms of hurricane intensity. An analysis of the maps showing the paths of LOWS published in the MONTHLY WEATHER REVIEW for the decade 1919–28 showed an annual average of 21 tropical disturbances entering the South or passing northward near the Atlantic coast.[3] This average was approximately the same as that for 1892–1912. Tropical cyclones usually lose intensity soon after crossing the coast; and the sharp decline in the number of excessive rains within about 100 miles from the Gulf and Atlantic coast is presumably largely due to this influence.[4]

Another reason for the greater frequency of torrential rainfalls in the South than in the North is the greater number of thunderstorms there. The South has an average of about twice as many thunderstorms as the North; and part of it has more than three times as many as a large part of the North.[5] Although thunderstorms characteristically yield heavy downpours, seldom in the North do they bring to any locality more than 4 to 6 inches in 24 hours; but in the South they frequently yield much heavier rainfalls.

The considerable number of tropical cyclonic disturbances in the South, in addition to the warm-front and cold-front thunderstorms, also makes it more likely that a given locality in the South will have two severe thunderstorms within a 24-hour period than is true for the North. A number of the heaviest rainfall records in the South, and a few of those in the North, resulted from two severe thunderstorms in one day.

Topographic conditions also help to explain the distribution of exceptionally heavy rains. The southern Appalachian mountains comprise a region of heavy rainfall (the greatest in eastern United States) partly because it has orographic as well as other types of rainfall. Several of the rains here discussed occurred in that region.

Orographic rains are also important in the San Gabriel range and other mountains near Los Angeles, where a number of exceptionally heavy rains have occurred, for example those of December 30–31, 1933, and March 2, 1938. Orographic influences are likewise sometimes significant elsewhere in California, and in western Oregon and Washington.

A topographic feature of importance in Texas is the Balcones Escarpment of the plateau region of Texas, especially of the Edwards Plateau. It is just west of several stations which have had exceptionally heavy rains, for example, Taylor, Austin, Smithville, and Montell, each of which has had rains in excess of 19 inches in 24 hours. These rains, however, were not orographic rains, as they occured below, not on or above the slope.[6] This escarpment seems sometimes to interfere with the northward migration of tropical disturbances, thus concentrating their rainfall.

Topographic influences are also sometimes evident near the Ozarks and neighboring elevations, as a number of exceptionally hard rains have occurred on their southern margin. In the Ozarks themselves, and in the adjacent area to the north, there have been relatively few records of 10-inch rains. Similarly, the region to the northwest of the Southern Appalachians, that is eastern Tennessee and Kentucky and northwestern Alabama, has had fewer such recorded rains than the zone nearer the Mississippi River. These areas of fewer hard rains may comprise a sort of "rain-shadow."

Finally, the large areas which lack any records of rainfall in excess of 10 inches in 24 hours merit a few words. In the Great Plains and Rocky Mountain States, the air generally is not humid enough to yield such large rainfalls, partly because of remoteness from effective sources of moisture. Of importance in the Great Plains also is the relatively rapid eastward movement of the rain-producing storms. In the Rocky Mountains, of possible significance is the fact that the records are nearly all from the valleys, not from well up on the mountain sides where the heaviest rains occur.

[2] Southern California had a rainstorm on March 2, 1938 of these proportions, which is described by Daingerfield, L. H., in the MO. WEA. REV., 66:139–143. However, 1938 is not one of the 10 years especially studied.

[3] Visher, S. S.: Frequencies of Tropical Cyclones especially those of minor importance. MO. WEA. REV. 58: 62–64, 1930.

[4] Idem. Effects of Tropical Cyclones on the Weather of Midlatitudes. Geographical Rev. 15: 106–114, 1925. Also, Tropical Cyclones of the Pacific, Bishop. Museum Bull. No. 20, 165 pp., Honolulu, 1925.

[5] Alexander, W. H.: The Distribution of Thunderstorms in the United States, 1904–33. MO. WEA. REV. 63: 157–158, 1935.

[6] The Taylor, TEX., rain was the subject of an article in the MO. WEA. REV. 49: 496–497, 1921, by J. R. McAuliffe, who reported that the 23.1 inches received at Taylor fell in about 15 hours, (10.3 in 3 hours), and that the rainfall a short distance from Taylor was greater, possibly 30 inches. (Numerous tropical weather stations have recorded more than 30 inches in 24 hours; Baguio, Luzon, as much as 46 inches.)

THE RECORD RAINFALLS OF THE WORLD

The following chart, which is self-explanatory, has been compiled in the Hydrometeorological Section of the U. S. Weather Bureau. The authorities for the data are as follows, where (1) denotes John R. Theaman, *Excessive Rainfall Records*, 1929; and (2) refers to the MONTHLY WEATHER REVIEW, May 1919.

Opid's Camp, Calif	Apr. 5, 1926	(1).
Porto Bello, R. P.*	Nov. 29, 1911	(2).
Galveston, Tex	June 4, 1871	(2).
Curtea-de-Arges, Romania.	July 7, 1889	(2).
Guinea, Va	Aug. 24, 1906	(2).
Catskill, N. Y	July 26, 1819	*American Journal of Science and Arts*, vol. IV, 1822, pp. 124–142.
Campo, Calif	Aug. 12, 1891	(2).
Concord, Pa	Aug. 5, 1843	*Proceedings of the Delaware County Institute of Science*, October 1910.
Bassetere, St. Kitts, West Indies.	Jan. 12, 1880	(2).
Cherrapunji, India	June 14, 1876	(1).
Baguio, P. I	June 14–15, 1911	(1).
Cherrapunji, India	June 14–15, 1876	(2).
Funkiko, Formosa	July 18–20, 1913	(1).
Cherrapunji, India	June 12–15, 1876	(1).
Do	Aug. 1841	(1).
Silver Hill Plantation, Jamaica.	Nov. 4–11, 1909	(1).
Cherrapunji, India	Aug. 1841	(1).
Do	July 1861	(1).
Do	1861	(1).

*See also MO. WEA. REV., May 1920, vol. 48, pp. 274–276, Benjamin C. Kadel, "The most intense rainfall on record."